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PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant :	Robin R. Miles, et al.	Docket No. :	IL-10632
Serial No. :	09/733,857	Art Unit :	1753
Filed :	December 8, 2000	Examiner :	Alexander Stephan Noguerola
For :	DIELECTROPHORETIC CONCENTRATION OF PARTICLES UNDER ELECTROKINETIC FLOW		

TRANSMITTAL OF BRIEF ON APPEAL (PATENT APPLICATION - 37 CFR 192)

Transmitted herewith in **triplicate** is the **BRIEF ON APPEAL** in this application with respect to the Notice of Appeal filed on February 12, 2004.

The item(s) checked below are appropriate:

1. **STATUS OF APPLICANT**
   This application is on behalf of
   - ☐ other than a small entity.
   - ■ a small entity.
     A verified statement
     - ☐ is attached
     - ■ already filed.

2. **FEE FOR FILING APPEAL BRIEF**
   Pursuant to 37 CFR 1.17(e) the fee for filing the Appeal Brief is:
   - ■ small entity $165.00
   - ☐ other than a small entity $330.00

Appeal Brief fee due **$165.00**

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on February 24, 2004

Kathy E. Raymond

Kathy E. Raymond

3. **EXTENSION OF TIME**

☐ Applicant petitions for an extension of time under 37 CFR 1.136

Calculation of extension fee (37 CFR 1.17(a)-(d)):

	Total months requested	Fee for other than small entity	Fee for small entity
☐	one month	$110.00	$55.00
☐	two month	$420.00	$210.00
☐	three month	$950.00	$475.00
☐	four month	$1,480.00	$740.00
☐	five month	$2,010.00	$1,005.00
		Fee	**$000.00**

4. **FEE PAYMENT**

- Charge Account No. 12-0695 in the amount of **$165.00**.
- **Charge Account No. 12-0695 for any additional extension and/or fee required or credit for any excess fee paid.**

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Tel. No. (925) 424-6897

Date: February 13, 2004

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on February 24, 2004

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PATENT

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Honorable Commissioner for Patents
Alexandria, VA 22313-1450

Attention: Board of Patent Appeals and Interferences

Dear Sir:

APPELLANT'S BRIEF (37 C.F.R. § 1.192)

This brief is submitted in support of appellant's notice of appeal from the decision of the Examiner, mailed December 11, 2003, finally rejecting claims 1-6 of the subject application. Appellant's notice of appeal was mailed February 12, 2004.

This brief is transmitted in triplicate per 37 C.F.R. § 1.192.

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TABLE OF CONTENTS

I. IDENTIFICATION OF THE REAL PARTY OF INTEREST

The real party in interest is:

The Regents of the University of California and the United States of America as represented by the United States Department of Energy (DOE) by virtue of an assignment by the inventor as duly recorded in the Assignment Branch of the U.S. Patent and Trademark Office.

II. IDENTIFICATION OF RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF ALL THE CLAIMS, PENDING OR CANCELLED, AND IDENTIFYING THE CLAIMS APPEALED

The application as originally filed contained claims 1-9.

Claims 7, 8, and 9 were cancelled.

Claims 1-6 stand rejected.

The claims on appeal are claims 1-6.

The claims on appeal, claims 1-6 are reproduced in Appendix A.

IV. STATUS OF ANY AMENDMENT FILED SUBSEQUENT TO FINAL REJECTION

There have been no amendments filed subsequent to the final rejection mailed December 11, 2003.

V. SUMMARY OF THE INVENTION

Figures 1 and 2 schematically illustrate an embodiment of an apparatus for carrying out the present invention, with Figure 2 being a top view of a pair of

interdigitated electrodes of Figure 1. Figures 1 and 2 are the drawings that were originally submitted with Appellant's original application. Copies of Figures 1 and 2 are attached as EXHIBIT A.

The elements of Appellant's claims on appeal are "read on" Appellant's original specification as follows:

Appellant's Apparatus Claim 1. An apparatus for dielectrophoretic concentration of particles under electrokinetic flow and collecting said particles in a microfluidic channel using a combination of dielectrophoresis and electrokinetic/electroosmotic flow, comprising: a microfluidic channel section, said microfluidic channel section having a first end and a second end, ("Referring now to the drawings, a microfluidic device generally indicated at 10 includes at least one microfluidic channel 11," Appellant's Original Specification Page 4, lines 25-26)

means for producing electrokinetic flow in said microfluidic channel section by producing a DC voltage across said first end and said second end of said microfluidic channel section, said means for producing electrokinetic flow in said microfluidic channel section by producing a DC voltage across said first end and said second end of said microfluidic channel section comprising a positive electrode connected to said first end of said microfluidic channel section and a negative electrode connected to said second end of said microfluidic channel section and a DC power supply connected to said positive electrode and said negative electrode, ("A DC voltage supply 13 having a positive electrode 14 and a negative electrode 15 located at opposite ends of channel 11 produces a voltage across the ends of the channel 11 to initiate an electrokinetic/electroosmotic flow field indicated by arrow 16." Appellant's Original Specification Page 5, lines 3-6)

at least one pair of interdigitated electrodes located on a surface of said microfluidic channel, said interdigitated electrodes comprising a first electrode plate having first electrode projecting legs and a second electrode plate having second

electrode projecting legs, said first electrode projecting legs and said second electrode projecting legs interlaced ("Each of electrode plates 18 and 19 include projecting legs 22-23 and 24-25, with leg 22 located intermediate legs 24 and 25 and with leg 25 been located intermediate legs 22 and 23." Appellant's Original Specification Page 5, lines 10-13), and

means for producing said combination of dielectrophoresis and electrokinetic/electroosmotic flow by producing an AC voltage across the interdigitated electrodes, said means for producing said combination of dielectrophoresis and electrokinetic/electroosmotic flow comprising an AC power supply connected to said first electrode plate having first electrode projecting legs and said second electrode plate having second electrode projecting legs which sets up a non-uniform electric field proximate said first electrode plate having first electrode projecting legs and said second electrode plate having second electrode projecting legs, said non-uniform electric field collecting said particles. ("An AC power supply 17 provides a voltage which is applied across the electrode plates 18 and 19 of interdigitated electrodes 12, as shown in Figure 2," Appellant's Original Specification Page 5, lines 6-8)

Appellant's Claim 2. The apparatus of Claim 1, wherein said at least one pair of interdigitated electrodes located on a surface of said microfluidic channel comprises a plurality of pairs of interdigitated electrodes along a length of said microfluidic channel section. ("Interdigitated electrodes are patterned on the inner surface of a microfluidic channel" Appellant's Original Specification Page 4, lines 6-7)

Appellant's Claim 3. In a microfluidic device using electrokinetic/electroosmotic flow to sweep particles down a microfluidic channel section for dielectrophoretic concentration of particles under and collecting said particles in said microfluidic channel section using a combination of dielectrophoresis and

electrokinetic/electroosmotic flow, said microfluidic channel section having a first end, a second end and an inner section, ("Referring now to the drawings, a microfluidic device generally indicated at 10 includes at least one microfluidic channel 11," Appellant's Original Specification Page 4, lines 25-26) an improvement comprising:

means for producing said electrokinetic/electroosmotic flow in said microfluidic channel section by producing a DC voltage across said first end and said second end of said microfluidic channel section, said means for producing said electrokinetic/electroosmotic flow in said microfluidic channel section by producing a DC voltage across said first end and said second end of said microfluidic channel section comprising a positive electrode connected to said first end of said microfluidic channel section and a negative electrode connected to said second end of said microfluidic channel section and a DC power supply connected to said positive electrode and said negative electrode, ("A DC voltage supply 13 having a positive electrode 14 and a negative electrode 15 located at opposite ends of channel 11 produces a voltage across the ends of the channel 11 to initiate an electrokinetic/electroosmotic flow field indicated by arrow 16." Appellant's Original Specification Page 5, lines 3-6)

interdigitated electrodes patterned on said inner surface of said microfluidic channel section, said interdigitated electrodes comprising a first electrode plate having first electrode projecting legs and a second electrode plate having second electrode projecting legs, said first electrode projecting legs and said second electrode projecting legs interlaced("Each of electrode plates 18 and 19 include projecting legs 22-23 and 24-25, with leg 22 located intermediate legs 24 and 25 and with leg 25 been located intermediate legs 22 and 23." Appellant's Original Specification Page 5, lines 10-13), and

means for producing said combination of dielectrophoresis and electrokinetic/electroosmotic flow by applying an AC voltage across said interdigitated electrodes to set up a non-uniform electric field capable of trapping said particles using a dielectrophoretic force as said particles are swept down the microfluidic channel

electrokinetically said means for producing said combination of dielectrophoresis and electrokinetic/electroosmotic flow comprising an AC power supply connected to said first electrode plate having first electrode projecting legs and said second electrode plate having second electrode projecting legs which sets up said non-uniform electric field proximate said first electrode plate having first electrode projecting legs and said second electrode plate having second electrode projecting legs, said non-uniform electric field trapping said particles. (An AC power supply 17 provides a voltage which is applied across the electrode plates 18 and 19 of interdigitated electrodes 12, as shown in Figure 2," Appellant's Original Specification Page 5, lines 6-8)

Appellant's Claim 4. The improvement of Claim 3, wherein said interdigitated electrodes patterned on said inner surface of said microfluidic channel section comprises a plurality of spaced pairs of interdigitated electrode located along a length of said microfluidic channel section. ("Interdigitated electrodes are patterned on the inner surface of a microfluidic channel" Appellant's Original Specification Page 4, lines 6-7)

Appellant's Claim 5. The improvement of Claim 3, wherein said patterned interdigitated electrodes each comprises a first section with spaced second and third sections extending transversely from said first section, said first section of each electrode being positioned substantially parallel, with a third section of one of the electrodes being located intermediate the spaced second and third sections of the other electrode. ("Each of electrode plates 18 and 19 include projecting legs 22-23 and 24-25, with leg 22 located intermediate legs 24 and 25 and with leg 25 been located intermediate legs 22 and 23." Appellant's Original Specification Page 5, lines 10-13)

Appellant's Method Claim 6. A method for concentrating particles under flow,

comprising: forming at least one pair of interdigitated electrodes on a fluidic microchannel having a multiplicity of first electrode projecting legs and a second multiplicity of electrode projecting legs, positioning at least one pair of interdigitated electrodes so that said first electrode projecting legs and said second electrode projecting legs are interlaced ("Each of electrode plates 18 and 19 include projecting legs 22-23 and 24-25, with leg 22 located intermediate legs 24 and 25 and with leg 25 been located intermediate legs 22 and 23." Appellant's Original Specification Page 5, lines 10-13), and

sweeping said particles through said fluidic microchannel by applying an AC voltage across the interdigitated electrodes to establish a non-uniform electric field capable of trapping particles using an dielectrophoretic force, controlling said voltage applied to each pair of interdigitated electrodes("An AC power supply 17 provides a voltage which is applied across the electrode plates 18 and 19 of interdigitated electrodes 12, as shown in Figure 2," Appellant's Original Specification Page 5, lines 6-8), and

applying a DC voltage across ends of the fluidic microchannel to initiate an electrokinetic/electroosmotic flow field., ("A DC voltage supply 13 having a positive electrode 14 and a negative electrode 15 located at opposite ends of channel 11 produces a voltage across the ends of the channel 11 to initiate an electrokinetic/electroosmotic flow field indicated by arrow 16." Appellant's Original Specification Page 5, lines 3-6)

VI. CONCISE STATEMENT OF THE ISSUES PRESENTED FOR REVIEW

Claims 1-6 stand finally rejected under 35 U.S.C. §103(a) as being obvious over the combination of the Primary McBride et al reference (US 6,296,752), the Secondary Becker et al reference (US 6,287,832), and the Tertiary Bakewell et al reference ("Characterization of the dielectrophoretic movement of DNA in mico-fabricated

structures"). The Final Rejection was stated in paragraphs numbers 2 and 3 of the Office Action mailed December 1, 2003.

It is Appellant's position that none of the three references used in the Office Action show certain significant elements of Appellant's rejected claims, and that it would not be obvious to combine the three references to meet Appellant's claims 1-6.

The issue presented for review is:

Issue Whether it would be obvious to combine the Primary McBride et al reference, the Secondary Becker et al reference, and the Tertiary Bakewell et al reference to meet Appellant's claims 1-6?

VII. GROUPING OF THE CLAIMS

Group – The issue covers the claims 1-6.

VIII. ARGUMENTS OF THE APPELLANT, WITH EACH ISSUE IN SEPARATE HEADINGS, WITH RESPECT TO EACH ISSUE PRESENTED FOR REVIEW

Issue Whether it would be obvious to combine the Primary McBride et al reference, the Secondary Becker et al reference, and the Tertiary Bakewell et al reference to meet Appellant's claims 1-6?

Graham v. John Deere Co. - The factual inquiries set forth in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966) that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) include "Ascertaining the differences between the prior art and the claims at issue."

Appellant's have identified nine (9) specific elements and three (3) specific steps of Appellant's claims 1-6 that are not shown by the Primary McBride et al Reference.

The Primary McBride et al Reference - "In an embodiment, the power source is programmed to deliver voltage to each of three or more said electrodes by periodically reversing the voltage polarity applied to the electrodes with a frequency of at least 10

Hz while maintaining a desired net effect. Preferably, the power source is programmed to deliver voltage to each of three or more said electrodes over an operating period of time encompassing at least one polarity cycle satisfying either (a) a first ratio of a voltage- integrated area A 1 associated with a first polarity to a voltage- integrated area A 2 associated with the other polarity or (b) a second ratio of a charge q 1 carried by the current associated with a first polarity to a charge q 2 carried by the current associated with the other polarity is less than 1: ½ and more than about ½:1." (Col. 1, lines 41-54)

"Motive Force for Moving Molecules - The motive force can be provided by the internal electrodes, such as electrodes 1, which can be operated by a traveling wave protocol which moves the molecules, or pursuant to a protocol wherein each electrode has a successively larger or smaller voltage." (Col 5, lines 44-49)

Figure 4 of the McBride et al reference is provided below.

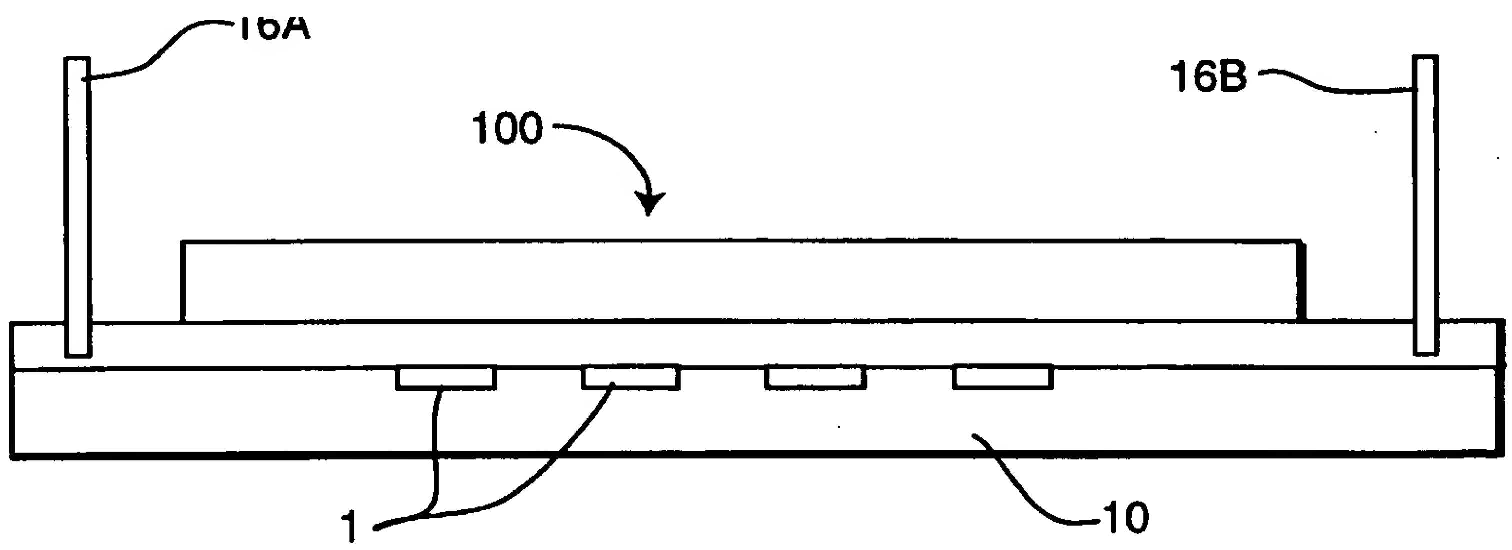

FIG. 4

"FIG. 4 illustrates an embodiment where the internal electrodes 1 are supplemented with additional electrodes, in this case first external electrode 16 A and second external electrode 16 B, which provide all or a substantial part of the field that moves the molecules. Electrodes 1 can serve to create changes that add to the molecular discrimination provided by the electrophoretic movement driven by first external electrode 16 A and second external electrode 16 B, as will be described below." (Col. 3, lines 34-46)

Missing Elements and Steps - The Primary McBride et al reference fails to disclose the following nine (9) specific elements and three (3) specific steps of Appellant's claims 1-6:

(Element 1) means for producing electrokinetic flow in said microfluidic channel section by producing a DC voltage across said first end and said second end of said microfluidic channel section,

(Element 2) a positive electrode connected to said first end of said microfluidic channel section and a negative electrode connected to said second end of said microfluidic channel section and a DC power supply connected to said positive electrode and said negative electrode,

(Element 3) at least one pair of interdigitated electrodes located on a surface of said microfluidic channel,

(Element 4) a first electrode plate having first electrode projecting legs,

(Element 5) second electrode plate having second electrode projecting legs,

(Element 6) said first electrode projecting legs and said second electrode projecting legs interlaced,

(Element 7) means for producing said combination of dielectrophoresis and electrokinetic/electroosmotic flow by producing an AC voltage across the interdigitated electrodes, said means for producing said combination of dielectrophoresis and electrokinetic/electroosmotic flow comprising an AC power supply connected to said first electrode plate having first electrode projecting legs and said second electrode plate having second electrode projecting legs which sets up a non-uniform electric field proximate said first electrode plate having first electrode projecting legs and said second electrode plate having second electrode projecting legs, said non-uniform electric field collecting said particles.

(Element 8) a plurality of pairs of interdigitated electrodes along a length of said microfluidic channel section,

(Element 9) said patterned interdigitated electrodes each comprises a first section with spaced second and third sections extending transversely from said first section, said first section of each electrode being positioned substantially parallel, with a third section of one of the electrodes being located intermediate the spaced second and third sections of the other electrode.

(Step 1) positioning at least one pair of interdigitated electrodes so that said first electrode projecting legs and said second electrode projecting legs are interlaced,

(Step 2) applying an AC voltage across the interdigitated electrodes to establish a non-uniform electric field capable of trapping particles using an dielectrophoretic force,

(Step 3) applying a DC voltage across ends of the fluidic microchannel to initiate an electrokinetic/electroosmotic flow field.

<u>McBride et al Does Not Show a DC Power Supply</u> – The McBride et al reference does not show Appellant's DC power supply claim elements (1) and (2) or claim step (3). In numbered paragraph 1 of the Final Rejection mailed December 11, 2003 the statement was made, *"McBride et al provides electrodes 16A and 16B (in Figure 4) to create a DC electric field......"* Appellants have studied the McBride et al reference and do not believe it discloses a DC field. The McBride et al reference emphasizes that the "power source is programmed to deliver voltage to each of three or more said electrodes by periodically reversing the voltage polarity applied to the electrodes with a frequency of at least 10 Hz." The power source and electrodes are operated by a traveling wave protocol wherein each electrode has a successively larger or smaller voltage which moves the molecules. With regard to *electrodes 16A and 16B,* the McBride et al reference states, "the internal electrodes 1 are supplemented with additional electrodes, in this case first external electrode 16 A and second external electrode 16 B, which provide all or a substantial part of the field that moves the molecules." The only type of power source mentioned in the McBride et al reference is the "power source is programmed to deliver voltage to each of three or more said electrodes by periodically reversing the voltage polarity applied to the electrodes." The McBride et al power source is not a DC power source. Appellants submit that the Primary McBride et al reference does not show Appellant's claim elements (1) and (2) or claim step (3).

<u>McBride et al Does Not Show Interdigitated Electrodes Having Projecting Legs</u> -

The McBride et al reference does not show Appellant's interdigitated electrodes having projecting legs that comprise Appellant's apparatus claim elements (2) through (9) and method claim steps (1) and (2). The McBride apparatus electrodes are a series of individual electrodes and the power is delivered to the individual electrodes sequentially utilizing a traveling wave protocol to move the molecules.

Would Not Be Obvious to Combine the Three References - It would not be obvious to combine the Primary McBride et al reference, the Secondary Becker et al reference, and the Tertiary Bakewell et al reference to meet Appellant's claims 1-6. The Primary McBride et al reference lacks Appellant's nine (9) elements and Appellant's three (3) steps as explained above. There is no teaching to supplement the Primary McBride et al reference with the Secondary Becker et al reference and the Tertiary Bakewell et al reference to include Appellant's nine (9) elements and Appellant's three (3) steps. Also, there are reasons why the Primary McBride et al reference could not be modified to include Appellant's nine (9) elements and Appellant's three (3) steps.

McBride et al Teaches Away from a DC Power Source –The McBride et al reference teaches away from using a DC power source. The McBride apparatus utilizes a traveling wave protocol to move the molecules. The traveling wave protocol is produced by a power source programmed to deliver voltage to the electrodes by periodically reversing the voltage polarity applied to the electrodes with a frequency of at least 10 Hz. This is an AC power source and not a DC power source. A DC power source would not provide the traveling wave protocol of the McBride Apparatus.

The Primary McBride et al reference does not show Appellant's DC power supply apparatus claim elements (1) and (2) or method claim step (3) and it would not be obvious to use either the Secondary Becker et al reference or the Tertiary Bakewell et al reference to modify the McBride apparatus to include DC power supply elements. Therefore, it would not be obvious to combine the Primary McBride et al reference, the Secondary Becker et al reference, and the Tertiary Bakewell et al reference to produce

Appellant's DC power supply claim elements 1-2 or claim step 3.

McBride et al Teaches Away From Interdigitated Electrodes Having Projecting Legs – Interdigitated electrodes having projecting legs would defeat the purpose of the McBride apparatus and the McBride et al reference teaches away from using interdigitated electrodes having projecting legs. The McBride apparatus electrodes are a series of individual electrodes and the power is delivered to the individual electrodes sequentially utilizing the traveling wave protocol to move the molecules. If interdigitated electrodes having projecting legs were used in place of the McBride electrodes, the traveling wave protocol would not function to move the molecules. Interdigitated electrodes having projecting legs would render the McBride apparatus inoperative for its intended purpose of moving the molecules.

In the McBride apparatus a traveling wave is created to move the molecules by power delivered sequentially to the individual electrodes. Appellant's claimed system specifies "interdigitated electrodes having projecting legs" with the "projecting legs interlaced." It would be impossible to have the McBride power delivered sequentially to Appellant's "interdigitated electrodes having projecting legs," particularly with the "projecting legs interlaced." The power would go to Appellant's "projecting legs" at one time, not sequentially as required by the McBride reference.

The purpose of the McBride apparatus is "moving the molecules;" whereas the purpose of Applicants claimed system is "trapping particles." Applicants claimed system operates by "applying an AC voltage across the interdigitated electrodes to establish a non-uniform electric field capable of trapping particles using a dielectrophoretic force."

The Primary McBride et al reference does not show the interdigitated electrodes having projecting legs that comprise Appellant's apparatus claim elements (2) through (9) and method claim steps (1) and (2). The Primary McBride et al reference teaches away from using interdigitated electrodes having projecting legs. Therefore, it would

not be obvious to use either the Secondary Becker et al reference or the Tertiary Bakewell et al reference to modify the McBride apparatus to produce Appellant's interdigitated electrodes having projecting legs, claim elements 2-9 or steps 1-2.

IX. SUMMARY

In summary, none of the three references used in the Office Action show certain significant elements and steps of Appellant's rejected claims and it would not be obvious to combine the three references.

The Primary McBride et al reference fails to disclose Appellant's DC power supply that constitutes claim elements (1) and (2) and method claim step (3). The McBride et al reference teaches away from using a DC power source. The only type of power source mentioned in the McBride et al reference is the "power source is programmed to deliver voltage to each of three or more said electrodes by periodically reversing the voltage polarity applied to the electrodes." The McBride et al power source is not a DC power source.

The Primary McBride et al reference fails to disclose the interdigitated electrodes having projecting legs that constitutes Appellant's apparatus claim elements (2) through (9) and method claim steps (1) and (2). The McBride apparatus electrodes are a series of individual electrodes and the power is delivered to the individual electrodes sequentially utilizing the traveling wave protocol to move the molecules. The traveling wave protocol is produced by a power source programmed to deliver voltage to the electrodes by periodically reversing the voltage polarity applied to the electrodes. It would be impossible to have the McBride power delivered sequentially to Appellant's "interdigitated electrodes having projecting legs," particularly with the "projecting legs interlaced." The power would go to Appellant's "projecting legs" at one time, not sequentially as required by the McBride reference. Also, the purpose of the McBride apparatus is "moving the molecules;" whereas the purpose of Applicants claimed

system is "trapping particles."

It would not be obvious to combine the Primary McBride et al reference, the Secondary Becker et al reference, and the Tertiary Bakewell et al reference to meet Appellant's claims 1-6.

It is respectfully requested that all of the claims on appeal (claims 1, 2, 3, 4, 5, and 6) be allowed.

Respectfully submitted,

By: Eddie E. Scott

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Date: February 23, 2004

Attachments:

Appendix

Exhibit A

APPENDIX

Claim 1. (previously presented)An apparatus for dielectrophoretic concentration of particles under electrokinetic flow and collecting said particles in a microfluidic channel using a combination of dielectrophoresis and electrokinetic/electroosmotic flow, comprising:

a microfluidic channel section, said microfluidic channel section having a first end and a second end,

means for producing electrokinetic flow in said microfluidic channel section by producing a DC voltage across said first end and said second end of said microfluidic channel section, said means for producing electrokinetic flow in said microfluidic channel section by producing a DC voltage across said first end and said second end of said microfluidic channel section comprising

a positive electrode connected to said first end of said microfluidic channel section and a negative electrode connected to said second end of said microfluidic channel section and a DC power supply connected to said positive electrode and said negative electrode,

at least one pair of interdigitated electrodes located on a surface of said microfluidic channel, said interdigitated electrodes comprising a first electrode plate having first electrode projecting legs and a second electrode plate having second electrode projecting legs, said first electrode projecting legs and said second electrode projecting legs interlaced, and

means for producing said combination of dielectrophoresis and electrokinetic/electroosmotic flow by producing an AC voltage across the interdigitated electrodes, said means for producing said combination of dielectrophoresis and electrokinetic/electroosmotic flow comprising

an AC power supply connected to said first electrode plate having first electrode projecting legs and said second electrode plate having second electrode projecting legs

which sets up a non-uniform electric field proximate said first electrode plate having first electrode projecting legs and said second electrode plate having second electrode projecting legs, said non-uniform electric field collecting said particles.

Claim 2. (previously presented) The apparatus of Claim 1, wherein said at least one pair of interdigitated electrodes located on a surface of said microfluidic channel comprises a plurality of pairs of interdigitated electrodes along a length of said microfluidic channel section.

Claim 3. (previously presented) In a microfluidic device using electrokinetic/electroosmotic flow to sweep particles down a microfluidic channel section for dielectrophoretic concentration of particles under and collecting said particles in said microfluidic channel section using a combination of dielectrophoresis and electrokinetic/electroosmotic flow, said microfluidic channel section having a first end, a second end and an inner section, an improvement comprising:

means for producing said electrokinetic/electroosmotic flow in said microfluidic channel section by producing a DC voltage across said first end and said second end of said microfluidic channel section, said means for producing said electrokinetic/electroosmotic flow in said microfluidic channel section by producing a DC voltage across said first end and said second end of said microfluidic channel section comprising

a positive electrode connected to said first end of said microfluidic channel section and a negative electrode connected to said second end of said microfluidic channel section and a DC power supply connected to said positive electrode and said negative electrode,

interdigitated electrodes patterned on said inner surface of said microfluidic channel section, said interdigitated electrodes comprising a first electrode plate having first electrode projecting legs and a second electrode plate having second electrode projecting legs, said first electrode projecting legs and said second electrode projecting

legs interlaced, and

means for producing said combination of dielectrophoresis and electrokinetic/electroosmotic flow by applying an AC voltage across said interdigitated electrodes to set up a non-uniform electric field capable of trapping said particles using a dielectrophoretic force as said particles are swept down the microfluidic channel electrokinetically said means for producing said combination of dielectrophoresis and electrokinetic/electroosmotic flow comprising

an AC power supply connected to said first electrode plate having first electrode projecting legs and said second electrode plate having second electrode projecting legs which sets up said non-uniform electric field proximate said first electrode plate having first electrode projecting legs and said second electrode plate having second electrode projecting legs, said non-uniform electric field trapping said particles.

Claim 4. (previously presented) The improvement of Claim 3, wherein said interdigitated electrodes patterened on said inner surface of said microfluidic channel section comprises a plurality of spaced pairs of interdigitated electrode located along a length of said microfluidic channel section.

Claim 5. (previously presented) The improvement of Claim 3, wherein said patterned interdigitated electrodes each comprises a first section with spaced second and third sections extending transversely from said first section, said first section of each electrode being positioned substantially parallel, with a third section of one of the electrodes being located intermediate the spaced second and third sections of the other electrode.

Claim 6. (previously presented) A method for concentrating particles under flow, comprising:

forming at least one pair of interdigitated electrodes on a fluidic microchannel having a multiplicity of first electrode projecting legs and a second multiplicity of electrode electrode projecting legs,

positioning at least one pair of interdigitated electrodes so that said first electrode projecting legs and said second electrode projecting legs are interlaced, and

sweeping said particles through said fluidic microchannel by

applying an AC voltage across the interdigitated electrodes to establish a non-uniform electric field capable of trapping particles using an dielectrophoretic force,

controlling said voltage applied to each pair of interdigitated electrodes, and

applying a DC voltage across ends of the fluidic microchannel to initiate an electrokinetic/electroosmotic flow field.

Claims 7-9 (canceled).

IL-10,632 S-94,234

EXHIBIT A

1/1

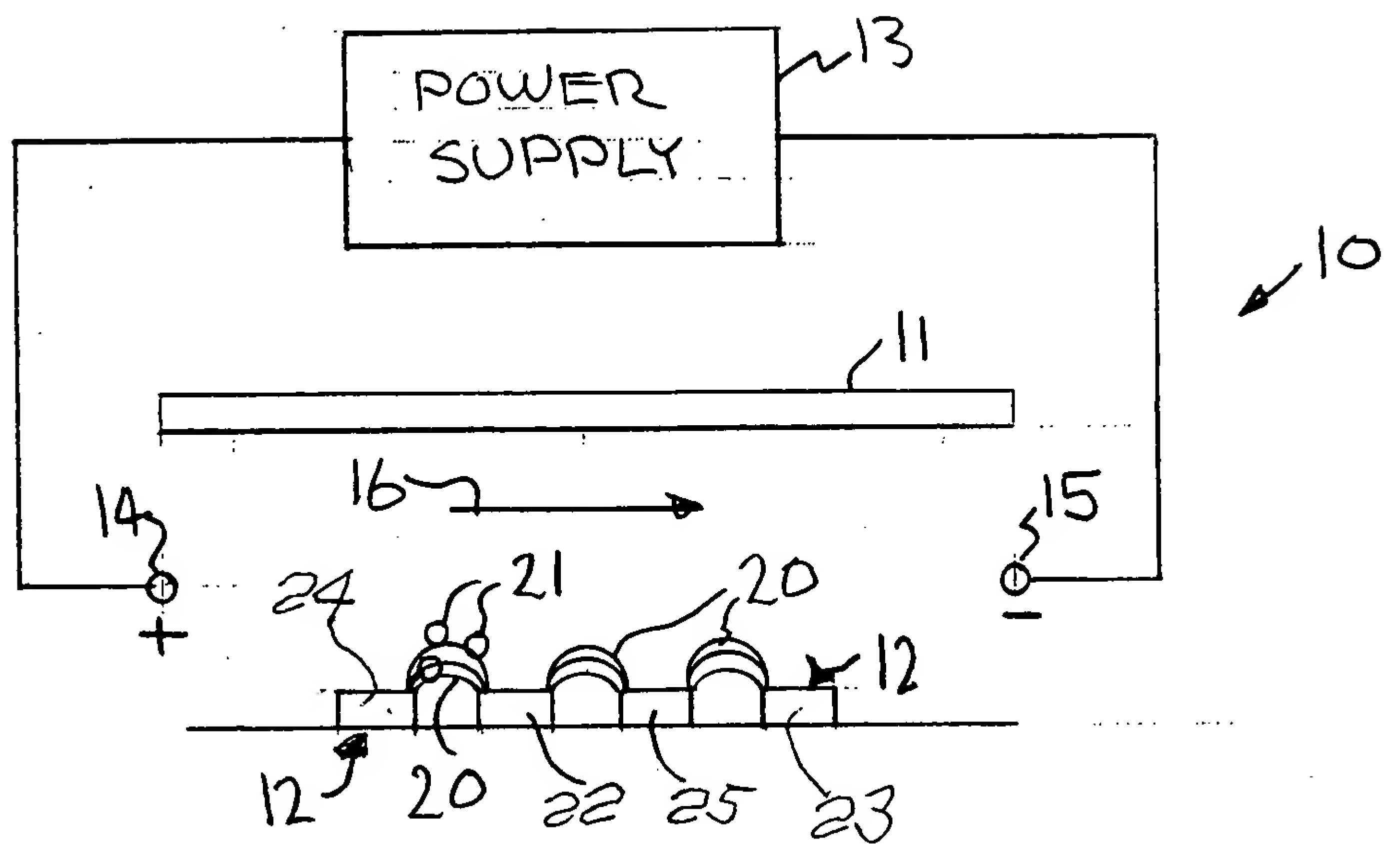

FIG. 1

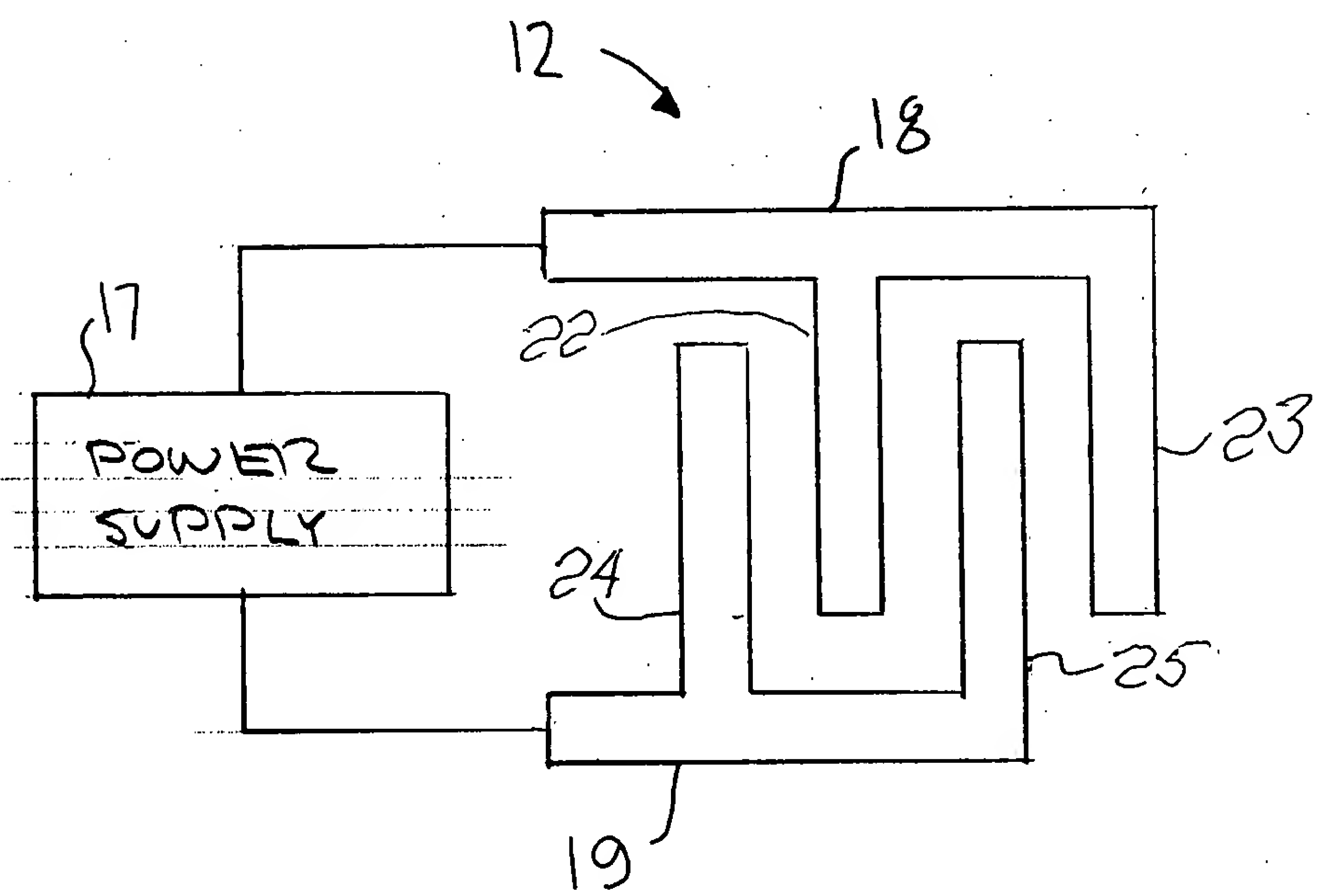

FIG. 2